FIG. 13 shows a laser scanner according to another embodiment of the present invention. --.

Page 23, after line 7, insert the following:

-- According to another aspect of the present invention there is provided an optical scanner for scanning indicia having areas of different light reflectivity, comprising:

a light source for producing a light beam;

a scanning optical element for receiving the light beam and producing a scanning light beam therefrom; and

a beam-shaping reflector comprising an aplanar mirror for shaping the beam.

By reflecting from an aplanar surface, any desirable beam shape may be achieved. If the reflector is shaped both in the X direction and in the Y direction, beam shaping in both dimensions may be achieved. Alternatively, if a cylindrical mirror is used, the beam may be shaped only in one dimension. The aplanar surface may comprise the scanning mirror, or alternatively a stationary fold mirror.

Proper beam shaping using a cylindrical mirror in this way can enable the designer to reduce the spot size in the vertical (Y) direction at large scanning distances. This improves visibility. In addition, spot size for near distances (0-30 inches) is increased, thereby improving dot matrix performance.

In addition, the shaping may be carried out by reflecting the light beam from one or more stationary mirrors either after or before the light has impinged upon a scanning element. In its most general form, beam shaping is carried out by reflecting the beam from one or more aplanar surfaces.

FIG. 13 shows a multiple-range laser scanner, for example for a bar code reader, comprising a first embodiment of the present invention. In the embodiment shown, a laser diode 400 produces a light beam which is directed to a scanning mirror 412 via a small central hole 413 in a fold mirror 414. The fold mirror 414 is a segmented or multiple mirror comprising three separate mirror portions 416, 418, 420. The mirror portion 416 is convex, the mirror portion 418 is planar and the mirror portion 420 is concave. As the scanning light beam produced by the scanning mirror 412 moves across the fold mirror 414 it strikes each of the mirror portions 416, 418, 420 in turn. The light reflected from the fold mirror passes out of the scanner housing 422 through a window or aperture 424 to impinge upon an indicia 426 to be read.

The indicia 426 is shown at three possible positions, a near position 428 corresponding to the working distance of the mirror portion 420, a middle distance 430 corresponding to the working distance of the mirror portion 418, and a far distance 432 corresponding to the working portion of the mirror portion 416. It will be appreciated, of course, that in a practical embodiment there will be considerably greater spacing between the

positions 428, 430 and 432: in the drawing the spacings are shown closer than they would be in reality, merely for the sake of clarity.

The result of the three separate mirror portions is that three separate scan lines are produced, the first at the position 428, the second at the position 430 and the third at the position 432. The intention is, accordingly, that whatever the distance of the indicia 426 from the scanner, it has a very good chance of being read by at least one of the scan lines. It will be appreciated of course that the indicia does not need to be exactly at one of the distances 428, 430, 432 in order to be decodable; there is in each case a substantial depth of field, and depending upon the actual distances these depths of field may even overlap so that they effectively merge into one complete "working region" within which the bar code symbol will almost certainly be decodable.

The mirror portions are suitably angled so that the respective scan lines lie on top of one another, but are merely focused at different distances.

It is not essential that there are exactly three mirror portions; there could be two, or more than three, according to the requirements of the particular application. The exact mirror profiles may also be chosen according to the particular application (e.g., cylindrical). The profiles chosen will depend upon the required working ranges and also upon the profile of the scanning mirror 412. The scanning mirror 412 may preferably be flat, but may in some circumstances be aplanar, for example cylindrical or spherical. The mirror 412 could also be replaced by a rotating prism, polygon, hologram, lens, zone plate, or any